

We claim:

1. A gas meter and valve installation comprising:

gas supply plumbing for supplying gas to a point of use;

point of use plumbing for receiving gas from said gas supply plumbing;

5 a gas meter having a gas inlet connected to said gas supply plumbing and a gas outlet connected to said point of use plumbing for metering the quantity of gas used at said point of use such that a gas supply passage is established through said gas supply plumbing, said gas meter and said point of use plumbing; and

10 a gas flow shutoff valve positioned along said gas supply passage outside of said gas meter comprising a valve member movable between an open position in which said gas supply passage is open, allowing gas to flow through said gas meter and into said point of use plumbing, and a closed position in which said gas supply passage is substantially closed so that substantially no gas is allowed to flow into said point of use plumbing.

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2. The gas meter and valve installation of claim 1, wherein:

said gas flow shutoff valve comprises a housing having a valve gas inlet and a valve gas outlet, one of said valve gas inlet and said valve gas outlet being connected to said gas meter and the other of said valve gas inlet and said valve gas outlet being connected to one of said gas supply plumbing and said point of use plumbing; and

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a spacer having a spacer inlet and a spacer outlet is connected between the other of said gas supply plumbing and said point of use plumbing.

3. The gas meter and valve installation of claim 1, wherein said point of use plumbing comprises a service tee having an inlet, an outlet and a service opening having a plug therein.

4. The gas meter and valve installation of claim 1, wherein said gas inlet and said gas outlet  
5 comprise male inlet and outlet threads, one of said point of use plumbing and said gas supply plumbing comprising a union nut for connection with one of said male inlet and said male outlet threads, and said gas flow shutoff valve being connected between the other of said point of use plumbing and said gas supply plumbing and the other of said male inlet and said male outlet threads, said gas flow shutoff valve comprising a nut thereon for connection with the other of said male inlet  
10 and said male outlet threads and a total height that is equal to the height of said union nut.

5. A method of installing a gas meter with a shut-off valve with gas supply plumbing for supplying gas to a point of use and point of use plumbing for receiving gas from the gas supply plumbing, comprising:

15 connecting a gas inlet of a gas meter to the gas supply plumbing;

connecting a gas outlet of the gas meter to the point of use plumbing, whereby the gas meter can meter the quantity of gas used at the point of use, such that a gas supply passage is established through the gas supply plumbing, the gas meter and the point of use plumbing; and

positioning a gas flow shutoff valve along the gas supply passage outside of the gas meter,  
20 the meter comprising a valve member movable between an open position in which the gas supply passage is open, allowing gas to flow through the gas meter and into the point of use plumbing, and

a closed position in which the gas supply passage is substantially closed so that substantially no gas is allowed to flow into the point of use plumbing.

6. The method of claim 5, wherein:

5 the gas flow shutoff valve comprises a housing having a valve gas inlet and a valve gas outlet, one of said valve gas inlet and said valve gas outlet being connected to said gas meter and the other of said valve gas inlet and said valve gas outlet being connected to one of said gas supply plumbing and said point of use plumbing; and

10 a spacer having a spacer inlet and a spacer outlet is connected between the other of the gas supply plumbing and the point of use plumbing.

7. The method of claim 5, wherein the point of use plumbing comprises a service tee having an inlet, an outlet and a service opening having a plug therein.

15 8. The method of claim 5, wherein the gas inlet and the gas outlet comprise male inlet and outlet threads, one of the point of use plumbing and the gas supply plumbing comprising a union nut for connection with one of the male inlet and the male outlet threads, and the gas flow shutoff valve being connected between the other of the point of use plumbing and the gas supply plumbing and the other of the male inlet and the male outlet threads, the gas flow shutoff valve comprising a nut  
20 thereon for connection with the other of the male inlet and the male outlet threads and a total height that is equal to the height of the union nut.

9. A gas flow control system, comprising:

a gas passage including gas supply plumbing for supplying gas to a point of use and point of use plumbing for receiving gas from said gas supply plumbing;

a gas flow shutoff valve positioned between said gas supply plumbing and said point of use plumbing, said gas flow shutoff valve being capable of closing in response to a gas flow shutoff signal;

a controller remote from said gas flow shutoff valve capable of generating the gas flow shutoff signal; and

a communication link between said controller and said gas flow shutoff valve for sending the gas flow shutoff signal to said gas flow shutoff valve.

10. The gas flow control system of claim 9, wherein said controller comprises a seismic sensor for generating the gas flow shutoff signal.

11. The gas flow control system of claim 9, wherein said controller comprises a security system control comprising at least one device for generating the gas flow shutoff valve, said at least one device being selected from the group consisting of a CO sensor, a gas sensor, a smoke sensor, a fire alarm, a sprinkler, and a panic button.

12. The gas flow control system of claim 9, wherein said controller comprises a breakaway gas pipe portion positioned between said gas flow shutoff valve and the point of use, said breakaway gas pipe portion being weaker than said point of use plumbing, and the gas flow shutoff signal being generated upon breakage of said breakaway gas pipe portion.

13. The gas flow control system of claim 9, and further comprising a fuel cell positioned along said gas passage for generating electric power from gas flowing through said gas passage and having an electric power output connected with said gas flow shutoff valve and said controller.

5           14. The gas flow control system of claim 9, and further comprising a gas meter positioned between said gas supply plumbing and said point of use plumbing and an automatic meter reading device connected with said gas meter, said electric power output being connected with said automatic meter reading device for supplying power thereto.

10           15. The gas flow control system of claim 9, and further comprising a gas meter positioned between said gas supply plumbing and said point of use plumbing and an automatic meter reading device connected with said gas meter, said automatic meter reading device having a communication link with said controller for sending signals to said controller representing gas usage.

15           16. The gas flow control system of claim 15, wherein said controller monitors total gas usage over time and can transmit total gas usage information to a remote location.

20           17. The gas flow control system of claim 15, wherein said controller comprises a seismic sensor for detecting an earthquake, compares a gas flow rate per unit time before an earthquake is detected by said seismic sensor with a gas flow rate per unit time after an earthquake is detected by said seismic sensor to determine the possibility of a gas leak, and generates the gas flow shutoff signal based on the result of the comparison.

18. The gas flow control system of claim 15, wherein when said controller determines that an increase in the gas flow rate from before an earthquake to after an earthquake corresponds to a constant flow rate of an appliance, said controller does not generate the gas flow shutoff signal based on the result of the comparison.

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19. The gas flow control system of claim 9, wherein said gas flow shutoff valve comprises a pressure sensor for detecting pressure in said gas passage, said pressure sensor being in communication with said controller.

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20. The gas flow control system of claim 9, and further comprising:  
an electric interface device installed at an electric meter box for shutting off electric power;  
and  
a communication link between said electric interface device and said controller.

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21. The gas flow control system of claim 20, wherein said controller and said gas flow shutoff valve are connected to said electric interface to receive electric power therefrom.

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22. The gas flow control system of claim 21, and further comprising a gas meter positioned between said gas supply plumbing and said point of use plumbing and an automatic meter reading device connected with said gas meter, said automatic meter reading device having a communication link with said controller for sending signals to said controller representing gas usage, and said

automatic meter reading device being connected with said electric interface to receive electric power therefrom.

23. The gas flow control system of claim 9, wherein said gas flow shutoff valve is removably  
5 connected to a gas meter and one of said point of use plumbing and said gas supply plumbing.

24. The gas flow control system of claim 9, wherein a gas pressure sensor is disposed in said  
gas passage and connected with said controller, and wherein said controller monitors changes in  
pressure sensed by said gas pressure sensor and generates the gas flow shutoff signal when pressure  
10 changes sensed by said gas pressure sensor correspond to an abnormal condition.

25. The gas flow control system of claim 9, wherein said controller comprises a seismic sensor  
for determining if an earthquake happens, wherein a gas pressure sensor is disposed in said gas  
passage and connected with said controller, wherein said controller monitors changes in pressure  
15 sensed by said gas pressure sensor and wherein said controller generates the gas flow shutoff signal  
when said seismic sensor has determined that an earthquake has happened and said gas pressure  
sensor has sensed a pressure change thereafter.

26. The gas flow control system of claim 9, and further comprising:  
20 an electric interface connected to an electric meter box, said electric interface having a power  
output.

27. The gas flow control system of claim 26, wherein said power output is connected to an auxiliary device for receiving power therefrom, said auxiliary device being selected from the group consisting of an automatic meter reading device for a gas meter and an automatic meter reading device for an electric meter.

5           28. A method of retrofitting a gas shutoff valve with a gas meter installation between gas supply plumbing and point of use plumbing, comprising:

          disconnecting a gas meter from a pipe that connects to a service tee of the point of use plumbing;

10           removing the pipe that connects to the service tee from the service tee; and  
          connecting a gas flow shutoff valve and a shorter pipe than the pipe that connected to the service tee between the gas meter and the service tee.

15           29. The method of claim 28, wherein said disconnecting comprises completely removing the gas meter.

          30. The method of claim 28, wherein said disconnecting comprises pivoting the gas meter away from the pipe that connects to the service tee.

20           31. A method of fitting a gas shutoff valve with a gas meter installation between gas supply plumbing and point of use plumbing, comprising:

providing a gas flow shutoff valve having a union nut on one of an inlet side and an outlet side thereof and a thread portion for connection to a union nut on the other of the inlet side and the outlet side thereof;

5 connecting the union nut to a gas meter fitting having corresponding threads thereon on one of an inlet side and an outlet side of the gas meter;

connecting the thread portion of the gas flow shutoff valve to one of the gas supply plumbing and the point of use plumbing; and

10 connecting the other of inlet side and the outlet side of the gas meter to the other of the gas supply plumbing and the point of use plumbing.

32. The method of claim 31, wherein the thread portion of the gas flow shutoff valve is connected to the point of use plumbing.

15 33. A valve, comprising:

a housing having a gas inlet, a gas outlet and a gas passage therebetween;

a gate mounted in said housing so as to be movable in a direction across the gas passage between open and closed positions, said gate including a first portion having an opening therein that is positioned across said gas passage in said open position and a second portion that is positioned  
20 across said gas passage in said closed position;

an upstream seat mounted in said housing upstream of said gate, said upstream seat surrounding said gas passage and contacting said gate so as to form a seal between said housing and said gate on an upstream side of said gate; and

5 a downstream seat mounted in said housing downstream of said gate, said downstream seat surrounding said gas passage and contacting said gate so as to form a seal between said housing and said gate on a downstream side of said gate.

34. The valve of claim 33, wherein said gate comprises an orifice in said second portion thereof for allowing an amount of gas to pass therethrough in said closed position.

10 35. The valve of claim 33, wherein said housing comprises:

external threads corresponding to external threads of a standard gas meter on said gas inlet;  
and

15 a nut having internal threads corresponding to a standard gas meter nut on said gas outlet for attachment to a standard gas meter.

36. A fitting adapter for adapting a valve to fit with a standard union nut, said fitting adapter comprising an adapter body having a first end formed with external threads that are sized and adapted to engage with internal threads of the standard union nut and a second end that has internal threads  
20 that are sized and adapted to engage with external threads of a valve inlet or outlet connection of the valve.

37. The fitting adapter of claim 36, wherein said external threads of said adapter body are larger in diameter than said internal threads of said adapter body.

38. A fitting adapter for adapting a valve to fit with a standard union nut, said fitting adapter comprising an adapter body having a first end formed with external threads that are sized and adapted to engage with internal threads of the standard union nut and a second end that has external threads that are sized and adapted to engage with internal threads of a valve inlet or outlet connection of the valve.

39. The fitting adapter of claim 38, wherein said first end has a larger diameter than said second end.

40. A valve comprising:

a housing having a gas inlet, a gas outlet and a gas passage therebetween;

a gate mounted in said housing so as to be movable in a direction across the gas passage between open and closed positions, said gate including a first portion having an opening therein that is positioned across said gas passage in said open position and a second portion that is positioned across said gas passage in said closed position;

a spring positioned so as to bias said gate toward said closed position; and

a release pin movable between one position in which said release pin prevents said spring from moving said gate toward said closed position and another position in which said release pin releases

said spring and said gate so that said gate moves to said closed position under the biasing force of said spring.

41. The valve of claim 40, and further comprising a reset member interconnected with said  
5 gate for resetting said gate from said closed position to said open position.

42. The valve of claim 41, wherein said reset member extends from a point outside of said  
housing to said gate, said reset member having an end received in an elongate slot formed in said gate  
and said slot having a stop member at an end thereof so that when said gate is in said closed position,  
10 said reset member can be pulled from outside of said housing so that said end of said reset member  
engages said stop member and pulls said gate from said closed position.

43. The valve of claim 41, wherein said reset member extends from a point outside of said  
housing to said gate through a dynamic seal in said housing.

44. The valve of claim 43, wherein said reset member has a knob thereon positioned outside  
of said housing for manipulating said reset member, said being engageable with said housing through  
a static seal thereon.

45. The valve of claim 40, wherein said housing comprises a chamber adjacent to said gas  
20 passage, said chamber having a gate end through which said gate is movable and a spring end, said  
spring being compressed between said spring end and said gate in said open position.

46. The valve of claim 45, wherein said gate comprises a spring receiver on an end thereof in said chamber, said spring receiver receiving said spring therein, and said release pin, in said open position of said gate, extending into said chamber and engaging said spring receiver.

5           47. The valve of claim 40, wherein said release pin, in said open position of said gate, engages a member fixed with respect to said gate.

48. The valve of claim 47, wherein said release pin is movably supported by a bushing.

10           49. The valve of claim 48, wherein said release pin comprises an engagement end for engaging said member fixed with respect to said gate, a shaft portion slidable in said bushing and a stop for engaging said bushing so as to limit movement of said release pin.

15           50. The valve of claim 47, wherein release pin comprises a connector having an axial space therein and an actuator for actuating said release pin, said actuator comprising a link member that extends into said axial space and is axially movable therein.

20           51. The valve of claim 40, wherein said link member is positioned in said axial space so that when said actuator is actuated to move said gate to said open position, said link member axially moves a predetermined distance without axially engaging said connector of said release pin before axially engaging said connector of said release pin.

52. The valve of claim 51, wherein said actuator comprises a solenoid, a solenoid pin having said link member connected thereto, and a spring biasing said solenoid pin and said link member toward said release pin.

5 53. The valve of claim 40, wherein said release pin has a solenoid actuator mechanism having a solenoid pin connected to said release pin so that when said solenoid is actuated said solenoid pin moves a predetermined distance before said release pin is moved by said solenoid pin.

10 54. The valve of claim 40, wherein said release pin comprises means for actuating said release pin to move to said another position by engaging said release with an impact force.

55. The valve of claim 40, and further comprising a status indicator mounted on an exterior portion of said housing indicating an open or closed status of said gate.

15 56. The valve of claim 55, wherein said status indicator comprises a magnet and said gate comprises a magnetic material for attracting said magnet of said status indicator in one of said open and closed positions.

20 57. The valve of claim 47, wherein said member has a release pin engagement surface thereon that is angled with respect to the direction of movement of said gate, and said release pin has a gate member engagement surface angled with respect to the direction of movement of said gate thereon

for engagement with said release pin engagement surface of said member fixed with respect to said gate.

5 58. The valve of claim 47, wherein said release pin engagement surface and said gate member engagement surface are angled at the same angle with respect to the direction of movement of said gate.

59. The valve of claim 47, wherein said release pin comprises a roller for engagement with said member fixed with respect to said gate.

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60. The valve of claim 59, wherein said release pin is a solenoid pin and comprises a solenoid actuator for moving said solenoid pin.

15 61. The valve of claim 60, wherein said solenoid pin is movably supported in said solenoid actuator by a plurality of rollers mounted to said solenoid pin.

62. A valve comprising:

a housing having a gas inlet, a gas outlet and a gas passage therebetween;

20 a gate mounted in said housing so as to be movable in a direction across the gas passage between open and closed positions, said gate including a first portion having an opening therein that is positioned across said gas passage in said open position and a second portion that is positioned across said gas passage in said closed position;

a magnet mounted with said gate; and

a solenoid actuator for moving said magnet so that said gate is movable between said open and closed positions.

5           63. The valve of claim 62, wherein said housing comprises a chamber in which said magnet is movably positioned, said solenoid actuator surrounding said chamber.

64. The valve of claim 63, and further comprising a status indicator responsive to the position of said magnet in said chamber.

10           65. The valve of claim 64, wherein said status indicator comprises a magnetic material that is attracted to said magnet mounted with said gate when said gate is in said open position.

15           66. The valve of claim 65, wherein said status indicator further comprises a spring biasing said status indicator in a direction away from said magnet when said magnet mounted with said gate is in said closed position.

67. The valve of claim 63, wherein said magnet comprises N and S poles arranged along the direction of movement of said gate.

20           68. The valve of claim 63, wherein said chamber comprises a target made of a magnetic material for attracting said magnet toward said closed position of said gate.

69. An electricity shut-off arrangement, comprising:

an electric meter box mounting an electric meter;

a circuit breaker on said electric meter box for shutting off electricity;

a pull chain on said circuit breaker; and

5 a shut-off device connected with said pull chain for actuating said circuit breaker by pulling said pull chain, said shut-off device having a communication link for communicating with a remote controller for activating said shut-off device.

70. The electricity shut-off arrangement of claim 69, and further comprising a door closable

10 over said shut-off device.

71. An electricity shut-off arrangement, comprising:

a spring-loaded rotatable arm having a detention portion thereon;

a pull chain of a circuit breaker connected to another portion of said spring loaded arm; and

15 a release member movable between a detention position in which said release member engages said detention portion of said spring-loaded rotatable arm to detain said spring-loaded rotatable arm in a spring-loaded position and a release position in which said release member releases said detention portion so that said spring-loaded rotatable arm can rotate and pull said pull chain.

20 72. The electricity shut-off arrangement of claim 71, wherein:

said release member comprises a ball member;

said detention portion comprises an angled surface on said spring-loaded rotatable arm biasing  
said ball member away from said spring-loaded rotatable arm;

a release pin is movably mounted between a first position preventing said ball member from  
moving and a second position in which said ball member can move away from said detention portion;

5 and

a solenoid actuator for moving said release pin.

73. The electricity shut-off arrangement of claim 72, wherein said solenoid actuator comprises  
a solenoid pin connected with said release pin such that, upon actuation of said solenoid actuator, said  
10 solenoid pin moves and accelerates over a predetermined distance before engaging and moving said  
release pin.

74. The electricity shut-off arrangement of claim 72, wherein said release pin has a second ball  
member rollably positioned thereagainst at a position opposite to the first said ball member.

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75. The electricity shut-off arrangement of claim 71, wherein said release member comprises  
a solenoid pin spring-biased into engagement with said detention portion of said spring-loaded  
rotatable arm, said solenoid pin having a solenoid actuator for moving said solenoid pin against the  
spring-bias to release said spring-loaded rotatable arm.

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76. An electric interface device for placement between an electric meter and a meter box, said  
electric interface device comprising:

a pair of interface plugs for connection to receptacles of a meter box;

a pair of interface receptacles for connection to a pair of electric meter plugs, wherein said pair of interface plugs are electrically connected with said pair of interface receptacles, respectively; and

5 an electricity shut-off for shutting off the electrical connection between at least one of said pair of interface plugs with a respective one of said pair of interface receptacles.

77. The electric interface of claim 76, wherein:

10 said electricity shut-off comprises a connector connecting the at least one of said pair of interface plugs with the respective one of said pair of interface receptacles and a solenoid actuator for moving said connector to break the electrical connection.

15 78. The electric interface of claim 76, and comprising a housing having a first interface flange thereon for connection with a meter box flange and a second interface flange thereon for connection with a meter flange.

79. The electric interface of claim 76, wherein said electricity shut-off has a communication link with a remote controller.

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80. The electric interface of claim 76, and further comprising an external power connection for supplying power.

81. An electric interface shut-off arrangement comprising:

a meter box having a pair of receptacles;

an electric meter having a pair of electric meter plugs;

an interface between said meter box and said electric meter comprising:

5 a pair of interface plugs connected to said receptacles of said meter box;

a pair of interface receptacles connected to said pair of electric meter plugs, wherein  
said pair of interface plugs are electrically connected with said pair of interface receptacles,  
respectively; and

10 an electricity shut-off for shutting off the electrical connection between at least one  
of said pair of interface plugs with a respective one of said pair of interface receptacles.

82. The electric interface shut-off arrangement of claim 81, wherein:

15 said electricity shut-off comprises a connector connecting the at least one of said pair of  
interface plugs with the respective one of said pair of interface receptacles and a solenoid actuator  
for moving said connector to break the electrical connection.

83. The electric interface shut-off arrangement of claim 81, and comprising a housing having  
a first interface flange thereon connected with a meter box flange and a second interface flange  
20 thereon connected with a meter flange.

84. The electric interface of claim 81, wherein said electricity shut-off has a communication link with a remote controller.

85. The electric interface of claim 81, and further comprising an external power connection  
5 on said interface for supplying power.

86. An electric interface arrangement, comprising:

a meter box;

10 an electric meter for connection to said meter box;

an interface disposed between said meter box and said electric meter, said interface comprising  
an electric power supply for supplying electric power therefrom.